

CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

1. A method of forming a junction or switch between at least two conductors incorporated into a fabric, comprising the steps of:
 - providing a fabric with at least two conductors incorporated therein;
 - bringing the conductors into contact with each other at a junction point; and
 - forming a bond between the conductors at the junction point.
2. The method of claim 1, wherein the conductors are conductive fibers.
3. The method of claim 2, wherein the conductive fibers are insulated, and further comprising the step of removing insulation from two intersecting individually insulated conductive fibers to expose the individually conductive fibers, wherein the step of removing the insulation includes
 - placing the fabric incorporating the individually insulated conductive fibers between a surface and a masking device, and
 - dispensing a solvent through the masking device;
4. The method of claim 1, wherein the conductors include a conductive fiber and a connector.
5. The method of claim 4, wherein the masking device is patterned with a via at the intersection of the two conductors.
6. The method of claim 1, wherein the fabric comprises a computer-generated pattern of intersecting conductive fibers and the masking device comprises a computer-generated pattern with multiple vias that correspond to the pattern of intersecting conductive fibers in the fabric.

7. The method of claim 1, wherein the masking device comprises a material chosen from screen-printing material, plastic, and metal.
8. The method of claim 1, wherein the step of bringing the conductors into contact with each other at a junction point comprises at least one of chemical bonding, laser light application, ultrasonic welding, and combinations thereof.
9. The method of claim 1, wherein the step of bringing the conductors into contact with each other at a junction point comprises:
 - placing fabric incorporating the conductors between an anvil and a sonotrode;
 - aligning a desired junction point of the conductors at the contact point of the anvil and sonotrode; and
 - subjecting the conductors to ultrasonic vibrations while pressing the sonotrode and anvil into contact at the junction point.
10. The method of claim 1, further comprising identifying pre-selected points of junction between the two conductors.
11. The method of claim 1, wherein the fabric is already woven or knitted.
12. The method of claim 1, wherein the method is carried out during formation of the fabric.
13. The method of claim 1, wherein forming a bond between the conductors at the junction point comprises:
 - creating intense friction between the conductors, thereby exciting the conductors;
 - breaking atomic bonds within each individual conductor; and
 - triggering atomic binding forces between the two conductors.
14. The method of claim 1, further comprising the step of depositing a conductive paste at the junction point of the two conductors.

15. The method of claim 14, wherein the step of depositing a conductive paste at the junction point comprises:

placing the fabric incorporating the conductors between a second surface and a second masking device; and
dispensing a conductive paste through the masking device.

16. The method of claim 1, wherein the method is performed off-line after fabrication of the fabric.

17. A system that forms a junction between individually conductive fibers incorporated into a fabric, comprising:

an apparatus that brings the individually conductive fibers into contact with each other at a junction point and forms a bond between the conductive fibers at the junction point.

18. The system of claim 17, further comprising a second apparatus that removes insulation from two intersecting individually insulated conductive fibers to expose the individually conductive fibers.

19. The system of claim 17, wherein the apparatus is chosen from a single textillography device and an array of textillography devices, wherein a textillography device is a device that enables the rapid realization of information routing architectures in textile structures.

20. The system of claim 17, wherein the textillography device is disposed above and below the fabric and moves in at least one of the following directions: a two-dimensional X-Y direction along the fabric, and a three-dimensional X-Y-Z direction along and above the fabric.

21. The system of claim 17, wherein the system is situated in a fabric manufacturing assembly line, and wherein the system further comprises at least one of:

a rail upon which the first apparatus is situated, the rail being disposed above the fabric

and a turntable to which each of the first and second apparatuses is connected.

22. The system of claim 17, wherein the apparatus is chosen from a chemical deposition device, a laser, an ultrasonic welder, and combinations thereof.

23. A system for forming a junction between at least two conductors incorporated into a fabric, comprising:

means for bringing the conductors into contact with each other at a junction point; and

means for forming a bond between the conductive fibers at the junction point.

24. The system of claim 23, wherein the conductors are conductive fibers.

25. The method of claim 23, wherein the conductors include a conductive fiber and a connector.

26. The system of claim 23, wherein the conductors are insulated, and further comprising at least one of:

means for removing insulation from two intersecting individually insulated conductors to expose the individual conductors; and

means for depositing a conductive paste at the junction point of the two conductors.

27. The system of claim 26, wherein the conductive paste comprises a material that ensures that bonding occurs between the conductors at the junction point and increases conductivity of the fibers at the junction point.

28. The system of claim 26, wherein the means for removing the insulation comprises at least one of a chemical etching apparatus, a device for mechanical removal of the insulation, and ultrasonic welder, a laser, a heating apparatus, and combinations thereof.

29. The system of claim 23, wherein the means for bringing the conductors into contact with

each other at a junction point comprises at least one of a chemical, a laser, an ultrasonic welder, and combinations thereof.

30. The system of claim 23, wherein the means for forming a bond between the conductors at the junction point comprises:

means for exciting the conductors;

means for breaking atomic bonds within each individual conductor; and

means for triggering atomic binding forces between the two conductors.

31. A method for forming a junction or switch, comprising the steps of:

providing an apparatus for forming an electrically conductive bond between two conductors;

providing the apparatus with means to identify the desired location for the electrically conductive bond;

bringing the apparatus into contact with the conductors and bringing the conductors into contact with each other at the desired location; and

forming an electrically conductive bond between the conductors at the desired location to thereby form said junction or switch.